

CLAIMS

What is claimed is:

- 5 1. A method for use in a communication network for enabling a signaling node to automatically update routing instructions that are maintained at a network routing node, the method comprising:
  - 10 (a) at a signaling node in an Internet protocol network, generating a routing key registration message, the routing key registration message including data for updating the status of routing key information associated with the signaling node;
  - (b) sending the routing key registration message to a network routing node capable of routing messages between the IP network and an SS7 network; and
  - 15 (c) at the network routing node, receiving the routing key registration message and using the data in the routing key registration message to dynamically update a routing key database entry associated with a connection between the signaling node and the network routing node.
- 20 2. The method of claim 1 wherein generating a routing key registration message includes generating a transport adapter layer interface (TALI) message.
- 25 3. The method of claim 1 wherein generating a routing key registration message includes generating a stream control transmission protocol (SCTP) message.
- 30 4. The method of claim 1 wherein generating a routing key registration message includes generating an SS7 MTP level two user adaptation layer (M2UA) message.

5. The method of claim 1 wherein using the information contained in the routing key registration message to dynamically update a routing key database entry includes using a destination point code (DPC) value in the routing key registration message to update a DPC in the routing key database entry.  
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6. The method of claim 1 wherein using information contained in the routing key registration message to dynamically update a routing key database entry includes using a origination point code (OPC) value in the routing key registration message to update an OPC in the routing key database entry.  
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7. The method of claim 1 wherein using information contained in the routing key registration message to dynamically update a routing key database entry includes using a service indicator (SI) value in the routing key registration message to update an SI in the routing key database entry.  
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8. The method of claim 1 wherein using information contained in the routing key registration message to dynamically update a routing key database entry includes using a circuit identification code (CIC) value or range in the routing key registration message to update a CIC value or range in the routing key database entry.  
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9. The method of claim 1 wherein using information contained in the routing key registration message to dynamically update a routing key database entry includes using a subsystem number (SSN) value in the routing key registration message to dynamically update a subsystem number value in the routing key database entry.  
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10. The method of claim 1 wherein sending the routing key registration message includes sending the message over an IP socket.  
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11. A method for routing a signaling message by a network routing node, the method comprising:
  - (a) receiving a signaling message that requires routing;
  - 5 (b) using information contained in the signaling message to search for a match in a first routing key table;
  - (c) in response to locating a match in the first routing key table, routing the signaling message using routing information returned by the first routing key table;
  - 10 (d) in response to failing to locate a match in the first routing key table, using the information contained in the signaling message to search for a match in a second routing key table; and
  - 15 (e) in response to locating a match in the second routing key table, routing the signaling message using routing information returned by the second routing key table.
12. The method of claim 11 wherein receiving a signaling message includes receiving a signaling system 7 (SS7) signaling message.
- 20 13. The method of claim 11 wherein receiving a signaling message includes receiving a transport adapter layer interface (TALI) signaling message.
- 25 14. The method of claim 11 wherein receiving a signaling message includes receiving a stream control transmission protocol (SCTP) signaling message.
- 30 15. The method of claim 11 wherein receiving a signaling message includes receiving a session initiation protocol (SIP) message.

16. The method of claim 11 wherein using information contained in the signaling message to search for a routing key match includes using a destination point code (DPC) value.
- 5 17. The method of claim 11 wherein using information contained in the signaling message to search for a routing key match includes using a origination point code (OPC) value.
- 10 18. The method of claim 11 wherein using information contained in the signaling message to search for a routing key match includes using a service indicator (SI) value.
- 15 19. The method of claim 11 wherein using information contained in the signaling message to search for a routing key match includes using a circuit identification code (CIC) value.
- 20 20. The method of claim 11 wherein searching for a match in a first routing key table includes searching for a match in a dynamic routing key table capable of receiving self-registration messages from IP nodes and automatically updating entries in the dynamic routing key table based on the self-registration messages.
- 25 21. The method of claim 11 wherein searching for a match in a second routing key table includes searching for a match in a static routing key table, containing routing key entries that are manually provisioned by an operator through a provisioning interface.
- 30 22. The method of claim 11 wherein using information contained in the signaling message to search for a routing key match includes using a subsystem number (SSN) value.

23. A method for performing reliable call signaling communications over an IP network using dynamic routing key registration, the method comprising:
- 5 (a) establishing a first connection between a signaling gateway and an IP node;
- (b) establishing a second connection between the signaling gateway and the first IP node
- (c) sending call signaling messages between the signaling gateway and the first IP node over the first connection; and
- 10 (d) in response to failure of the first connection, sending a routing key registration message from the first IP node to the signaling gateway over the second connection, the routing key registration message including at least one SS7 routing key for dynamically diverting signaling messages originally destined to be sent over the first connection to the second connection.
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24. The method of claim 23 comprising establishing a third connection between the signaling gateway and a second IP node, and in response to detecting failure of the first IP node, sending a second routing key registration message from the second IP node to the signaling gateway, the second routing key registration message including at least one SS7 routing key for dynamically diverting traffic originally destined for the first IP node to the second IP node.
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25. The method of claim 23 wherein the first IP node comprises a media gateway controller.
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26. The method of claim 23 wherein the first and second IP nodes each comprise media gateway controllers.
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27. The method of claim 23 wherein the first IP node comprises a service control point.

28. The method of claim 23 wherein the first and second IP nodes each comprise a service control point.
- 5 29. A communication system that is adapted to enable a signaling node to automatically provide routing instructions to a signaling message routing node, the system comprising:
- 10 (a) a signaling node that is adapted to generate and send a routing key registration message that contains routing key instructions associated with the signaling node, the routing key instructions including at least one SS7 message routing parameter to be examined in incoming call signaling messages for directing the call signaling messages to the signaling node; and
- 15 (b) a signaling message routing node that is adapted to receive the routing key registration message and dynamically update a routing key database entry based on the routing key instructions.
- 20 30. The system of claim 29 wherein the signaling node is a media gateway controller (MGC) node.
31. The system of claim 29 wherein the signaling node is a service control point (SCP) node.
- 25 32. The system of claim 29 wherein the signaling node is a database server node.
- 30 33. The system of claim 29 wherein the routing key registration message is a transport adapter layer interface (TALI) message.

34. The system of claim 29 wherein the routing key registration message is a stream control transmission protocol (SCTP) message.
- 5 35. The system of claim 29 wherein the routing key instructions associated with the signaling node include a destination point code (DPC) value.
- 10 36. The system of claim 29 wherein the routing key instructions associated with the signaling node include an origination point code (OPC) value.
- 15 37. The system of claim 29 wherein the routing key instructions associated with the signaling node include a service indicator (SI) value.
- 20 38. The system of claim 29 wherein the routing key instructions associated with the signaling node include a circuit identification code (CIC) value.
- 30 39. The system for claim 29 wherein the routing key instructions associated with the signaling node include a subsystem number (SSN) value.
40. The system of claim 29 wherein the signaling message routing node is an SS7-to-IP gateway routing node.
41. The system of claim 29 wherein the routing database includes a dynamic routing key table and a static routing key table.
42. The system of claim 29 wherein the routing database includes a single routing key table that includes both dynamic routing key data and static routing key data.

43. The system of claim 42 wherein the dynamic routing key data and static routing key data components of the routing key table are each binary tree (b-tree) indexed.
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44. A network routing node that is adapted to receive routing key registration information from an associated signaling node and subsequently use the routing key registration information to update a routing database, the network routing node comprising:
- 10 (a) a communication module adapted to receive a routing key registration message from an IP node in an IP network, the routing key registration message including data for dynamically updating a routing key entry associated with a connection between the communication module and the IP node; and
- 15 (b) a dynamic routing key table adapted to dynamically update SS7 message routing data for a routing key table entry associated with the connection based on the information contained in the routing key registration message.
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45. The network routing node of claim 44 including a static routing key table containing static routing key information that is not updated with the routing information contained in the routing key registration message.
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46. The network routing node of claim 44 including a manager process for controlling the sequence in which the dynamic and static routing key tables are searched during a routing operation.
- 30 47. The network routing node of claim 44 wherein the communication module is a self-registration data communication module (sDCM).



48. The network routing node of claim 44 wherein the routing key registration message is a transport adapter layer interface (TALI) message.
- 5 49. The network routing node of claim 44 wherein the routing key registration message is a stream control transmission protocol message.
50. The network routing node of claim 44 wherein the SS7 message  
10 routing data includes a destination point code (DPC) value.
51. The network routing node of claim 44 wherein the SS7 message routing data includes an origination point code (OPC) value.
- 15 52. The network routing node of claim 44 wherein the SS7 message routing data includes a service indicator (SI) value.
53. The network routing node of claim 44 wherein the SS7 message routing data includes a circuit identification code (CIC).
- 20 54. A self-registration data communication module for receiving dynamic routing key registration requests from signaling nodes in an IP network and for dynamically updating a routing key table based on the routing key registration requests, the self-registration data communication module comprising:
- 25 (a) a TCP/IP sockets interface for receiving routing key registration request messages from one or more signaling nodes in an IP network;
- 30 (b) a dynamic routing key table for storing SS7 routing key information for routing SS7 signaling messages to the signaling nodes in the IP network based on corresponding routing key parameters in the signaling messages; and

- (c) dynamic routing key registration process for dynamically updating the routing key information in the routing key database in response to the routing key registration requests.

- 5 55. The self-registration data communication module of claim 54 wherein the TCP/IP sockets interface is adapted to receive routing key registration request messages from a media gateway controller (MGC).
- 10 56. The self-registration data communication module of claim 55 wherein the TCP/IP sockets interface is adapted to receive routing key registration request messages from a service control point (SCP).
- 15 57. The self-registration data communication module of claim 55 wherein the dynamic routing key table maps the SS7-based routing keys to TCP/IP socket associations for the signaling nodes in the IP network.